

MTBE — an additive on its way out

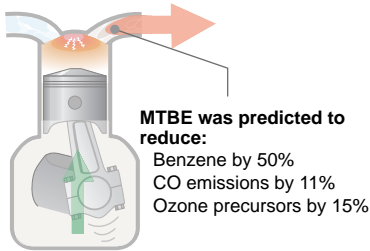
What is it and what does it do?

In use since 1979, initially to reduce engine knock, **methyl tertiary butyl ether** is an oxygenate that promotes more complete burning of gasoline.

The 1990 Clean Air Act required gasoline to be reformulated to reduce toxic pollutants.

In the Bay Area, in 1997, 95 percent of the gasoline contained MTBE. Gas is 11 percent MTBE, by volume.

MTBE is a byproduct of petroleum refining. It also can be made from natural gas.



How does it get into ground water?

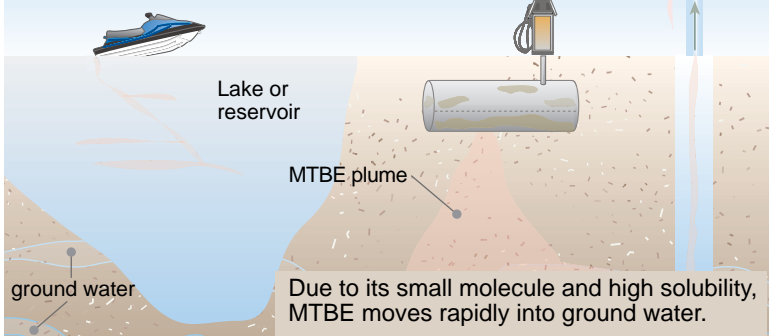
Watercraft:

An 80-horsepower, two-stroke watercraft emits one pound of MTBE every 24 miles traveled.

Leaking underground fuel tanks:

MTBE enters ground water primarily through leaking underground tanks.

Public/
private well



How widespread is it?

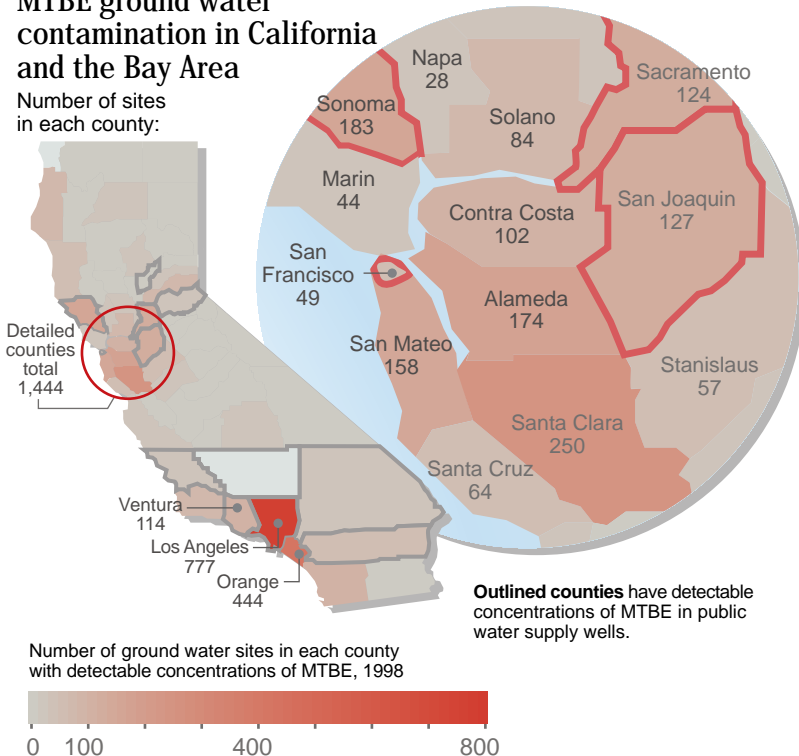
Number of contaminated ground water sites in California: 3,720

Number contaminated with more than 100 micrograms per liter: 2,100

Number of tank failures per year: 200 to 880

MTBE ground water contamination in California and the Bay Area

Number of sites in each county:



Outlined counties have detectable concentrations of MTBE in public water supply wells.

What effect does MTBE have on health and the environment?

Humans are exposed to MTBE via the water supply.

MTBE has a very unpleasant taste and odor, particularly above 20 to 40 micrograms per liter. A microgram is one-millionth of a gram.

Complaints of headaches, nausea, dizziness, and breathing difficulties were reported in various areas of the country after the introduction of gasoline containing MTBE.

Experiments indicated MTBE was carcinogenic in rats and mice that were exposed to levels 20,000 to 100,000 times the U.S. EPA standard. The long-term effects on humans are unknown.

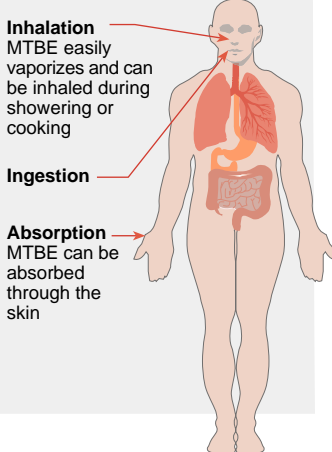
It can enter through:

Inhalation

MTBE easily vaporizes and can be inhaled during showering or cooking

Ingestion

MTBE can be absorbed through the skin



Standards for allowable amounts of MTBE have been established federally and by the state. ($\mu\text{g/L}$ = microgram per liter)

State EPA public health goal

14 $\mu\text{g/L}$: concentration at which cancer risk is 1 in 1 million

California standard

35 $\mu\text{g/L}$

U.S. EPA standard

20-40 $\mu\text{g/L}$

Water suppliers generally ship water that meets standards.

2,100 ground water sites throughout state

100 $\mu\text{g/L}$ or above

How much will it cost to clean up?

Cleanup of contaminated ground water sites is ongoing. A 1998 UC-Davis study estimated the annual cost at \$340 million to \$1.4 billion. In 1999 the federal Environmental Protection Agency will contribute \$4 million to assist California in cleaning up leak sites.

How will it be cleaned up?

Ban two-stroke watercraft in water-supply reservoirs and lakes.

Replace leaking underground storage tanks. Clean area surrounding tanks.

Filter and clean water at public sources.

Cost per 1,000 gallons of water treated: 23 cents to \$3.55

Cost per site: \$190,000

In San Pablo Reservoir MTBE levels have dropped nearly 50 percent since two-stroke engines were banned in 1998.

Ground water and contaminated soil cleanup will require removing the leaked gasoline. Extracted vapors will require above-ground treatment by burning or filtering. Contaminated water will be pumped above ground for treatment.

Scientists are also trying to find a bacteria that will eat MTBE.

Sources: EPA, UC-Davis Health and Environmental Assessment of MTBE, EBMUD, Knight Ridder Tribune

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